

2002 NOAA Initiative

Ocean Exploration and Research Initiative-- Deep Coral Communities, Reefs and Live Bottom (0 FTE, +\$6,000,000): NOAA requests an increase of \$6,000,000 to explore and study ocean frontier areas, including deep coral communities, reefs and benthic live bottom areas.

Background: The most biodiverse and productive seafloor habitats are those dominated by larger invertebrates such as corals and sponges, because of the architectural complexity, shelter and microhabitats these animals add to the benthos. Coral reefs are the premier example of such a system but these are generally limited to shallow tropical and sub-tropical waters. In deeper water below the reach of divers (50 to 1000 m depths), at all latitudes, important benthic communities are densely populated by many forms of attached species. They cluster where appropriate substrate is available for attachment. Hard substrate inhabited by dense growth of sessile forms, including algae, corals, and sponges is often called "live bottom." Oil and gas companies are specifically prohibited from drilling into live bottom, as defined. Most of the nation's National Marine Sanctuaries intentionally bound "live bottom" areas.

Similar to shallow water coral reefs, deeper "live-bottom" areas attract large numbers of commercially important species and their preferred prey. They are, however, much more extensive and of more widespread economic importance than tropical coral reefs. In the South Atlantic Bight, for example, 70% of the offshore fish are concentrated on 10% of the continental shelf that is live bottom. Knowing this, states and local agencies have established artificial reef programs to facilitate recreational fishing activity. Many of these wrecks are offshore so as not to be hazards to navigation, thus, hard to reach and study. Rather than helping resources by encouraging development of new productivity and live bottom, these reefs may contribute to demise of fisheries by making it easier to hunt and capture fish.

As coastal systems become over-exploited, fishermen hunt deeper offshore fisheries resources. Areas of the outer shelf and upper slope that were once lightly fished are now being intensely exploited. There is growing evidence that such deeper water coral/sponge assemblages are being extensively damaged in both the North Atlantic and Pacific Oceans due to the destructive fishing practices such as trawling and dragging. These productive offshore systems are being destroyed before we have even had a chance to document their distribution and character, nor even understand the ecology of their major components, and interactions that are so important to their sustainability.

There is growing awareness that deep sea corals and sponges influence the distribution of a variety of other organisms and support diverse communities that may be pharmacological storehouses. Further, these animals are extremely slow growing so human caused disturbance and removals can have long lasting effects on these communities (e.g., a moderate size specimen of deep sea coral *Primnoa* collected off northern Georges Bank had an estimated age of 500 years). These communities are inadequately conserved, partly as a result of ignorance about their importance, that at least in some cases serve as essential habitat for juvenile fishes.

Proposed Actions: Research is needed to determine the distribution, species associations, growth and recruitment rates in live bottom areas, and effects of human caused disturbances on deep sea coral and sponge communities. We propose an approach similar to that adopted for coral reefs by the US

Federal Coral Reef Task Force:

- \$ map targeted mid-depth live-bottom areas
- \$ conduct monitoring and assessment of the health of these communities
- \$ establish ecosystem research programs and long-term reference sites to identify and monitor threats to the health of these systems.
- \$ identify causes and rates of habitat destruction, and options for restoration.

Targeted areas will be frontier areas for which we lack required scientific understanding needed to manage related resources. They have special ecological, economic and management significance.

Examples (not inclusive) include:

Georges Bank: decline of commercial species due to over fishing and disturbance of the sea bed by dredging and trawling; large areas of the bank now closed to fishing; monitor habitat recovery in a gravel substrate to determine recovery rates and species succession; assess role of recovering gravel habitat as refuge for juvenile cod and as spawning ground for herring; monitor the growth of observed scallop populations that have colonized the area since fishing halted in 1995.

West Florida Shelf: highly productive commercial and sport fishery, accounting for over 90% of the landings in the Gulf of Mexico for several economically important species; Gulf of Mexico Fishery Management Council closed 540 square nautical miles along the 40 fathom (73 m) isobath to all reef fishing year-round to protect spawning and feeding aggregations of reef fish (e.g., gag grouper); map, characterize (at approximately 200nm²/yr), and relate the geology of the seabed to the distribution and abundance of spawning adults, eggs and juveniles.

Shelf/slope along the U.S. West Coast: groundfish populations declining all along the U.S. West Coast; many of these species are associated with rugged, heterogeneous substrata, thus, difficult to assess using conventional survey techniques; west coast research programs developing systematic approach to habitat classification in deep water using in situ methodologies and remote geophysical mapping techniques; need to expand this habitat characterization effort to spatial scale relevant to animal distributions, and physical, biological and anthropological (e.g., fishing gear impacts) processes that influence them.

Central Gulf of Alaska: important rearing area and migratory corridor for juvenile and molting crabs, and rich stocks of groundfish; North Pacific Fisheries Management Council closed an 1500 km² area known as Marmot Flats near Kodiak, Alaska to bottom trawling; map, characterize (at approximately 400 nm²/yr), and relate the geology of the seabed to the distribution and abundance of crab and groundfish stocks.

Northwest Hawaiian Islands: coral reefs that extend below dive depth are heavily fished and covered with debris from Pacific fishing activities (e.g., long-lines and ghost nets); deep coral beds are targeted for precious coral trade; these beds are habitat for deep fisheries and foraging for endangered monk seal; map, assess, and study reef and coral community health; continue debris removal efforts begun in 2000.

Partnerships: Partnerships are critical to the success of this program. The model for these regional

efforts will be the cooperative research program in marine habitat studies for the west coast region now being developed by the NOAA/NMFS laboratories of the Southwest and Northwest Fisheries Science Centers (La Jolla, Pacific Fisheries Environmental Lab, Santa Cruz/Tiburon, Newport, and Montlake). Their plan takes advantage of each laboratory's strengths (e.g., habitat classification, in situ technologies, molecular techniques, early life history studies, fishing gear development and operation). Funding and/or operational support from OAR/NURP, OAR/Sea Grant, NOS Sanctuary programs, and the Sustainable Seas Expeditions funded in part by NOS, will assist in ongoing projects relevant to these objectives.

Benefits: The cost of the failed groundfish stocks in the northeast U.S. has been easily in the billions of dollars. NOAA is still spending millions each year to buy back vessels. The Northeast Fisheries Center spent most of its dollars on stock assessment efforts using traditional fishing techniques. Management tools have been limited in their scope and effectiveness; they have not worked. The missing element in managing these stocks has been understanding of ecology. Trawls cannot effectively assess juvenile fish that hide under rocks and worse, kill them in the process of trying to find them. Marine Protected Areas are fast becoming recognized as the only realistic and effective management tool in many situations. They have saved declining fisheries in many areas of the world. The process of selecting and managing a protected area requires understanding of where and how the animals live-- the focus of ecology. NOAA will need this data to avoid litigation brought on by displaced fishermen.

Performance Measures:

	2002	2003	2004	2005	2006
PM: By 2006, 10% fewer overcapitalized fisheries (economic and social aspects)					
<i>Milestone (Refugia): Evaluate effects of refugia on spawning stocks, fishing efforts, and fishing communities</i>	describe two MPAs; east and west coast	Monitor MPAs and adjacent un-protected areas	continue monitoring and research to explain differences	continue monitoring and research	publish results
PM: By 2006, 60% of stocks have "essential fish habitat"					
<i>Milestone (Refine EFH): Identify EFH for specific life history stages of important species</i>	Describe EFH for at least two (east and west coast) over-fished species	Describe EFH for two more species	Determine fish/habitat associations by life stage	Target spawning and nursery grounds, determine critical features	publish results

Budget Growth (\$K):

Year	2002	2003	2004	2005	2006
	\$6000	\$6500	\$6500	\$6700	\$7000

Activities by year:

Regional Expeditions:

2002 -- Northeast Pacific; work with state, NMFS and OAR partners to map and characterize rockfish habitat; combine in situ technologies with towed acoustic and optical mapping gear to do a synoptic comparison; target area to be determined by NMFS and best available bathymetric data; total cost for 30 day expedition, including system time, ship time, science support data management and outreach activities, approximately \$2.5 million
outyears: expeditions move, similar activities

Collaborations:

Northwest Hawaiian Islands: deep dive support for NMFS/Honolulu to assess extent and impacts of lobster fishery on deep reefs; with NURC/Hawaii Undersea Research Lab (HURL) and Univ. of Hawaii to study deep coral beds (gold, pink, black); lease American Divers DeepWorkers and support ship for 10 days to extend depth range of NMFS studies; total \$400,000

Gulf of Mexico-- with FL Keys National Marine Sanctuary, NCCOS/Beaufort Lab, NMFS/SEFC, and NURC/southeast and Gulf of Mexico (SEGM) region; map and ecological assessment of deep areas of new Dry Tortugas Reserve; \$500,000
Gulf of Mexico-- with Flower Garden Banks NMS; piggy-back to provide assessment gear for mapping and characterization of Sanctuary below 50 meters, including Stetson Bank; \$300,000

Gulf of Mexico-- with NMFS and NURC/SEGM; characterize new FL Middle Grounds/Big Bend MPA; \$500,000

Southwest Atlantic-- with NMFS to continue characterization and restoration of Oculina Banks; \$400,000

Northwest Atlantic-- with NMFS, Stellwagen Bank NMS, NURC/North Atlantic and Great Lakes (NAGL) to characterize new closed area on Stellwagen Bank; similar cruise to Georges Bank closed area; assess gear impacts and MPA effectiveness; \$500,000

Outreach and Data management for all these activities = \$300,000

Technology R&D:

2002 -- design portable laser-line scan system that can be used in towed mode or from submersible; \$30,000

2003-- construct and test portable LLS; \$1 million